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CURRENT LITERATURE.

BOOK REVIEWS.

Fossil plants.

MORPHOLOGISTS have made but little use of the work of paleobotanists, both on account of the nature of the material and because paleobotanists too often have not been trained morphologists. The time for this feeling, however, has passed, and some of the most striking extensions of our morphological horizon have come from the work of paleobotanists. What was needed more than any thing else was the critical sifting of the vast accumulation of paleobotanical data from the standpoint of modern botany. In 1891, Count Solms-Laubach published his admirable *Fossil Botany*, which has ever since remained a standard work for botanists, although more destructive of previous claims than constructive. Very recently, however, Mr. A. C. Seward has begun his great work on *Fossil Plants*, but it has not yet included the vascular plants; Professor R. Potonié has published his *Lehrbuch der Pflanzenpaleontologie*, a very compact presentation of the subject; and M. R. Zeiller's *Éléments de Paléobotanique* has just appeared. All of these books stand for the newer paleobotany, which is to reject uncertain evidence and rest upon a foundation of morphology.

What the morphologist wishes, however, is the omission of details which are not pertinent to him, and the compact presentation of what paleobotany has definitely contributed to morphology. This has been done, and apparently well done, by Professor D. H. Scott, in a book which has just appeared.¹ His purpose has been "to present to the botanical reader those results of paleontological inquiry which appear to be of fundamental importance from the botanist's point of view." Since the important results have related almost entirely to pteridophytes and gymnosperms, the *Studies* are restricted to them. It is certainly true that Professor Scott has presented in a remarkably clear way just what botanists wish to know, but his data must be judged by paleobotanists. The book must be read for details, but some of the most striking suggestions for the consideration of morphologists are as follows.

The remarkable elaboration of Equisetales and Lycopodiales in the Paleozoic is fully set forth, and should form a part of every morphological presentation of these groups, the living representatives being totally inadequate for such a purpose. The most suggestive conclusion in this connection, however, is that these two groups, which seem to be so far apart now,

¹ SCOTT, DUNKINFIELD HENRY: *Studies in fossil botany*. 8vo. pp. xiii + 533, with 151 illustrations. London: Adam and Charles Black. 1900. 7s. 6d.

are but divergent lines from an ancient stock represented by the Sphenophyllales. Professor Scott regards the Sphenophyllales as worthy to stand as a gymnosperm group of primary rank. He would include in it not only Sphenophyllum and its acknowledged associates, but Cheirostrobus as well, a genus which strikingly combines the characters of Equisetales and Lycopodiales.

Of course the Filicales are fully considered, a group of enormous antiquity, having held its own since the Silurian, and whose habit was so predominant during the Paleozoic that many plants have been included with them whose real affinities are elsewhere. In general, Professor Bower's grouping of Filicales into the Simplices, Gradatae, and Mixtae is shown to have an historical basis.

One of the most interesting sections of the book is that devoted to a consideration of the Cycadofilices, a provisional Paleozoic group made to contain forms which combine the characters of Filicales and Cycadales, and most of them first described as ferns. The representative genera are *Lyginodendron*, *Heterangiuni*, and *Medullosa*, whose habits and anatomical features are strikingly intermediate, but whose spore-bearing members are unfortunately unknown. It is evident, however, that in them we have forms which strongly confirm the conclusion that cycads have been derived from ferns.

As was to be expected, the dominant gymnosperm group of the Paleozoic, Cordaitales, is set apart as of primary rank, and, associated with the Cycadofilices, seems to furnish the background for later gymnosperm development.

The author regards the Bennettitæ as but a very distinct phylum of the Cycadales, but to the reviewer it would appear that they are worthy of primary rank and the name Bennettitales. Their habit and anatomical structure seem to be almost identical with those of Cycadales, but the lateral sporangium-bearing shoots, the fern-like "ramenta," and more than all the remarkably modified and complex ovulate strobili and peculiar embryo, justify the claim for independence. This is further justified by the steadiness maintained by the peculiar structures throughout the numerous European forms, and in the still more extensive display of the group in the rich Mesozoic flora of the United States, from which Professor Ward has described numerous species under the generic name *Cycadoidea*. In this connection it is interesting to note the recent description by Dr. Wieland of the staminate strobili of *Cycadoidea ingens* Ward. The numerous sporophylls are borne upon a central axis, instead of upon a hemispherical receptacle as in the ovulate strobili, and each sporophyll bears a considerable number of linear sori, each sorus composed of twenty to forty clavate sporangia. It seems that the Mesozoic has obtained the name of the "age of cycads" from the display of Bennettitales, and that while doubtless true cycads existed, and among them the genus *Cycas*, they are somewhat indefinite and uncertain.

In discussing the general problem of the phylogeny of gymnosperms, the author fairly states the contending claims for its polyphyletic and monophyletic origin, but plainly inclines to the latter position. He sees no reason for imagining any connection whatsoever with the Lycopodiales, and still less with the Equisetales. The connection of Cycadales and Bennettiales with Filicales being considered as established, both through morphology and the paleobotanical evidence of such a group as Cycadofilices, "the derivation of the other gymnosperms centers about the extinct group Cordaitales," whose affinities with the Cycadales are clear.—J. M. C.

Tropical Nature.

COSTANTIN, the well-known French botanical philosopher, has issued a second volume in the series known as *Bibliothèque Scientifique Internationale*. His studies in various lines of botanical research, and especially his classic ecological papers on aquatic plants, have well fitted Costantin, both for his work on *Adaptation-Evolution*² and for the work which is the subject of this review.³ In the introductory chapters the author gives a realistic picture of the virgin forest of the tropics, and vividly recounts the first sensations that one has in these new scenes. After a few remarks on tropical climates, Costantin plunges at once into the very deepest ecological problems of the tropics. He first discusses the origin of forests, and takes up some of the types of trees that are peculiar to tropical forests. An interesting chapter on leaves follows, and some of the most recent studies, as those on hydathodes, are introduced. After a few pages on flowers and fruits, the author gives a brief survey of the geological history of forests, holding to the older view that the present tropical forests are fragmentary, but yet lineal descendants of those which have passed away. The lianas come in for an excellent treatment, four chapters being devoted to a discussion of the various classes and their origin. Chapters follow on epiphytes, especially those found among the tree tops; parasites of various classes; symbiosis, one chapter dealing with saprophytes, the other with the rôle of ants and other animals in influencing plant life. Saprophytism at one time would not have been given as the type of symbiosis, but recent studies on mycorrhiza makes such a classification necessary. The strictly botanical part of the volume closes with a chapter on mangroves and one on island floras, the latter from the geographic standpoint.

Though the volume is entitled *Tropical Nature*, it is confined practically to the plant world of the tropics. The last chapter is a curious exception and

² *Les végétaux et les milieux cosmiques (Adaptation-Evolution)*. 292 pp., with 171 figures in the text. Paris. 1898.

³ COSTANTIN, J.: *La nature tropicale*. 8vo. pp. 315. *figs.* 166. Paris: Félix Alcan. 1899. 6 fr.